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Application of the Gagnon and Collay Model in Improving High School Students' Learning Outcomes in Biology Subjects

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Article Info

ABSTRACT

Purpose of the study: This research aims to investigate the effectiveness of applying the Gagnon and Collay Model in improving Biology learning outcomes for class XI students at Public Senior High School 1 Bone-Bone, North Luwu Regency.

Methodology: This research is classroom action research which involves four components in each cycle. The research subjects consisted of 32 students of class XI Science 1 at Public Senior High School 1 Bone-Bone, North Luwu Regency. Data collection is carried out through tests and observation sheets in each cycle. Data analysis methods include qualitative and quantitative descriptive techniques.

Main Findings: From the analysis of student learning outcomes tests in each cycle, it can be observed that the abilities of class XI Science 1 students at Public Senior High School 1 Bone-Bone, North Luwu Regency, have increased. After implementing the Gagnon and Collay Learning Model, the students' average score increased from 63.5 in cycle I to 90.38 in cycle II. This shows an increase in biology learning outcomes after implementing the Gagnon and Collay Learning Model.

Novelty/Originality of this study: This research makes a significant contribution to the educational context by exploring and applying the Gagnon and Collay Model in improving student learning outcomes in Biology subjects. Through this approach, this research seeks to provide innovation in Biology teaching methods, aiming to create a learning environment that is more interactive, creative, and appropriate to the development of class XI Science 1 students.

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1.   INTRODUCTION

The importance of education for human life cannot be underestimated, because it is an essential need that must continue to be fulfilled throughout the course of life [1], [2]. Human groups will not be able to grow and develop in accordance with their aspirations towards progress, prosperity and happiness without education. Education is defined not only as an effort to provide information and form skills, but also involves efforts to realize individual desires, needs and potential in order to achieve a satisfying personal and social lifestyle [3], [4]. More than just preparation for the future, education has an important role in the lives of today's children who are developing towards adulthood.

The teaching and learning process is an educational dynamic that involves interactions between teachers and students, where the quality of the learning experience is greatly influenced by the relationship that exists between the two [5], [6]. The role of the teacher has undergone significant changes along with the evolution of views on education and children, requiring adaptation of the teacher's role as a professional educator. Teachers are involved in a series of learning activities, including strategic planning, presenting material, and evaluating learning outcomes, all directed towards achieving predetermined learning goals [7], [8]. Basically, the teaching and learning process can be interpreted as the transfer of messages from the source (lesson material) through channels or media (teachers) to the recipients of the message (students). When dealing with students with diverse characteristics, especially in science subjects and especially biology, learning planning becomes crucial to achieving effective and efficient learning goals.

Biology learning is an educational process that explores and understands life in all its aspects [9], [10]. Involving the study of the structure, function, growth, evolution and interactions of organisms, studying biology invites students to absorb the complexity of life around them. Biology teachers play an important role in guiding students to explore concepts such as genetics, ecology, and biochemistry, and understand their impact on the environment and humans. With an experimental, observation and data analysis approach, biology learning not only enriches students' knowledge, but also develops critical thinking skills and scientific abilities [11], [12]. The success of biology learning lies not only in understanding concepts, but also in students' ability to connect theory with everyday phenomena, encouraging the development of their analytical thinking. By utilizing technology, field practice, and interactive approaches, biology learning becomes a dynamic and inspiring means of forming a deep understanding of life on this planet.

The Gagnon and Collay model designs learning designs with the aim of improving student performance, leading to more positive behavioral changes. As a micro model, Gagnon and Collay focuses on the learning process experienced by students, with the foundation of constructivism theory. In this model, students are given a more dominant active role compared to the conventional model. The main concept in constructivism theory is the emphasis on the role of students in the learning process [13], [14]. Students are considered as parties who must actively develop their knowledge, not just teachers or other individuals. Responsibility for learning outcomes rests with students, and the importance of emphasizing active student involvement needs to be strengthened [15], [16]. Student creativity and participation are the keys to building a solid cognitive foundation in students' learning lives.

In the context of ordinary learning, we often encounter teachers who deliver material through lectures without involving supporting tools or media, which can make it difficult for students to understand the material without direct interaction or checking understanding. A problem that is often faced by researchers is the situation at Public Senior High School 1 Bone-Bone, North Luwu Regency, where teachers still apply the conventional learning paradigm. This condition has had a negative impact on the quality of education in these schools, with researchers finding that the level of improvement in the quality of education is still limited. A direct interview with a teaching staff at Public Senior High School 1 Bone-Bone, North Luwu Regency, showed that this problem still occurs frequently, especially in biology learning.

The lack of active involvement of students in the learning process also creates a dependency on teachers to adopt the lecture method as the main approach [17], [18]. Some students tend not to pay attention to lessons and engage in behavior that can be disruptive, such as going in and out of class without permission and conversations that are not related to the learning material. These things have the potential to harm students' academic progress due to a lack of focus and engagement in learning. Therefore, it is important to look for learning approaches that can stimulate student participation, increase learning motivation, and provide space for them to actively search for and understand material independently [19], [20]. Joint efforts between teachers and students in overcoming these challenges can improve the quality of learning and improve overall student learning outcomes.

Previous research regarding the application of learning models found that the use of discovery learning models could significantly improve students' biology learning outcomes [21]. Apart from that, the application of the make a match type cooperative learning model can also improve biology learning outcomes [22]. Based on several previous studies, this research will examine the application of the Gagnon and Collay learning model in improving student biology learning outcomes. The difference between this research and previous research lies in the application of the Gagnon and Collay learning model. The novelty of this research is that it can make a significant contribution in the educational context by exploring and applying the Gagnon and Collay Model in improving student learning outcomes in Biology subjects. Through this approach, this research seeks to provide innovation in Biology teaching methods, which aims to create a learning environment that is more interactive, creative and appropriate to student development.

Based on the explanation above, the problem formulation in this research is whether applying the Gagnon and Collay Model can improve biology learning outcomes for class XI students at Public Senior High School 1 Bone-Bone, North Luwu Regency. This research has a research objective, namely to find out the results of applying the Gagnon and Collay Model to improve biology learning outcomes in class XI students at Public Senior High School 1 Bone-Bone, North Luwu Regency.

2. RESEARCH METHOD
2.1 Types of Research

This research is classroom action research (Classroom Action Research). The classroom action research model applied in this research is a model developed by John Elliot. This classroom action research model emphasizes diversity and detail, where each cycle can consist of several actions. Instead, each action can involve several steps implemented in the form of learning activities. Classroom action research proposed by John Elliot includes four main components in each cycle, namely planning, action, observation and reflection, which are carried out repeatedly [23], [24]. An illustration of this model can be found in the following image:
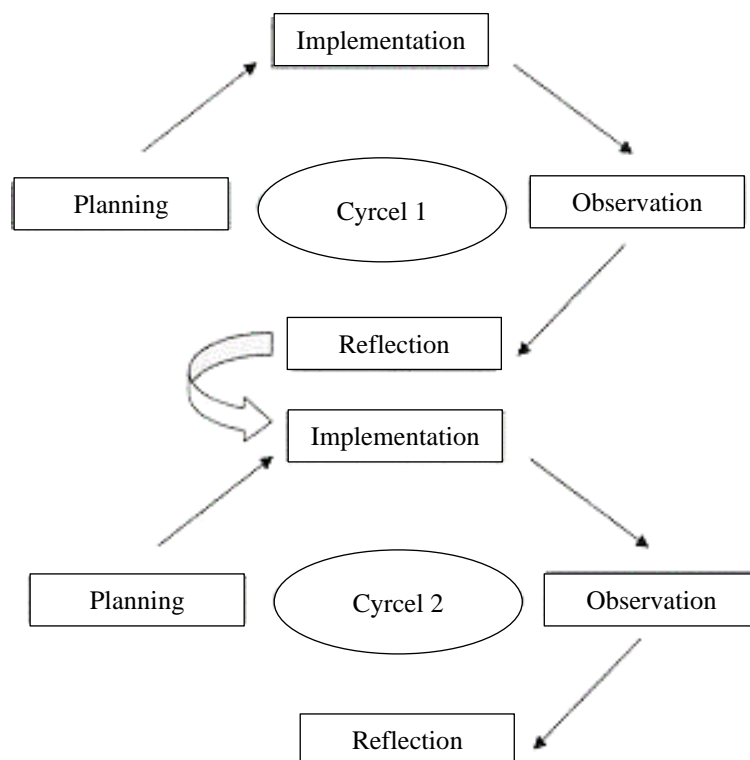

Figure 1. John Elliott's Classroom Action Research Model

2.2 Research Subject

This research was conducted at Public Senior High School 1 Bone-Bone, North Luwu Regency, with research subjects in the form of class XI Science 1 students, totaling 32 people.

2.3 Research Instrument

Research instruments are a very significant component in research because they act as a means of collecting data [25]–[27]. Therefore, it is important that the instrument is appropriate and relevant to the problem and aspect being investigated, in order to produce accurate data. In the context of this classroom action research, the instruments used consist of tests and observation sheets to collect data.

2.4 Data Analysis

Researchers use two types of data analysis to process data, namely quantitative data collection which involves formative test results as a data source. Qualitative data collection involves data from observation guides, both from teachers and students, taken during the teaching and learning process. Data analysis is a step taken after all data from respondents or other data sources have been collected [28]–[30]. The data that has been collected is then analyzed using a descriptive statistical approach. The guidelines that will be applied to convert raw scores obtained from students into standard scores (grades) with the aim of evaluating students' ability levels will follow the steps described in the procedures established by the Ministry of National Education.

Table 1. Completeness of learning outcomes

No	Value Interval	Category
1	0 – 34	Very low
2	35 – 54	Low
3	55 – 64	Currently
4	65 – 84	Tall
5	85 – 100	Very high

2.5 Success Indicators (Completion of Learning Outcomes)

The measure of the indicator for improving biology learning outcomes for class XI Science 1 students at Public Senior High School 1 Bone-Bone, North Luwu Regency is the test results given after the material has been taught. The researcher's measuring tool for determining student improvement after being given action or action is using the Ministry of National Education's completion assessment standard, which states that students are said to have completed learning if they get a minimum score of 65 from the ideal score, and classically complete if at least 85% of the total number of students have completed learning.

3.   RESULTS AND DISCUSSION
3.1. Results

Based on the results of descriptive analysis, test scores on student learning outcomes in the Biology subject after applying the Gagnon and Collay learning model during cycle I, a description of student Biology learning outcome scores was obtained which is shown in the following table:

Table 2. Statistics of Student Learning Outcome Scores in Cycle I

Statistics	Statistical Value
Number of Subjects	32
Ideal score	100
Highest score	80
Lowest score	40
Score range	40
Average score	63.5

From this table, it can be seen that the average score for student learning outcomes in Biology class XI Science 1 at Public Senior High School 1 Bone-Bone is 63.5. The scores obtained by students range from the lowest score, namely 40, to the highest score, namely 80, from the ideal score which should reach 100. This difference in scores of 40 shows quite a variety of student abilities. If student learning outcome scores are grouped into five categories then The distribution and percentages obtained are as follows:

Table 3. Frequency Distribution and Percentage of Test Result Scores for Class XI Science 1 Students of Public Senior High School 1 Bone-Bone District. North Luwu in Cycle I

No	Score	Category	Frequency	Percentage
1	0 – 34	Very low	0	0%
2	35 – 54	Low	1	3.12%
3	55 – 64	Currently	20	62.50%
4	65 – 84	Tall	11	34.37%
5	85 – 100	Very high	0	0%
	Amount		32	100%

From the table above, it shows that of the 32 students in class , and 11 people are in the high category with a percentage of 34.37%. Apart from that, according to the average score of student learning outcomes of 63.5 if converted to a frequency distribution table, it turns out to be in the medium category. This means that the average Biology learning outcomes for class XI Science 1 students at Public Senior High School 1 Bone-Bone are in the medium category.

By referring to descriptive analysis, Biology learning outcome scores after applying the Gagnon and Collay model in cycle II can be described in a description of students' Biology learning outcome scores which are documented in the following table.

Table 4. Statistics on Student Learning Outcome Scores in Cycle II

Statistics	Statistical Value
Number of Subjects	32
Ideal score	100
Highest score	96
Lowest score	72
Score range	24
Average score	90.38

From this table, it can be observed that the average value of student learning outcomes in Biology class XI Science 1 at Public Senior High School 1 Bone-Bone reached 90.38. The scores obtained by students ranged from the lowest score, namely 72, to the highest score, namely 96, from the ideal score which should reach 100. This difference in scores of 24 shows a relatively high level of student ability. If student learning outcome scores are grouped into five categories, the following distribution and percentages are obtained.

Table 5. Frequency Distribution and Percentage of Test Result Scores for Class XI Science 1 Students of Public Senior High School 1 Bone-Bone, North Luwu Regency in Cycle II

No	Score	Category	Frequency	Percentage
1	0 – 34	Very low	0	0%
2	35 – 54	Low	0	0%
3	55 – 64	Currently	0	0%
4	65 – 84	Tall	7	21.87%
5	85 – 100	Very high	25	78.12%
	Amount		32	100%

Based on table 5 above, it shows that of the 32 students in class Besides that, according to the average score of student learning outcomes of 90.38 if converted to a frequency distribution table, it turns out to be in the very high category. This means that the average Biology learning outcomes for class XI Science 1 students at Public Senior High School 1 Bone-Bone, North Luwu Regency is in the very high category.

Apart from an increase in student biology learning outcomes during cycle I and cycle II, there was also a change in student attitudes in the learning process. These changes are qualitative data obtained through observation sheets at each meeting for two cycles. The changes referred to are: (a) Increased student activity from cycle I to cycle II in the learning process, such as: responding to answers from other students and raising their hand to ask questions. (b) Increased student activity in working on questions and they help each other in working on questions so that teachers are not too overwhelmed in guiding students. (c) Fewer students do other activities when discussing lesson material.

In the learning process, students do not fully know the learning system that will be used. Apart from that, students also don't know how to apply this learning model. So quite a few students face obstacles in the learning process. The obstacles faced by students are that students find it difficult to accept the material provided so that more students do other activities outside the learning process. Students are not yet accustomed to the learning process which requires students to play an active role in the learning process. So not many students are able to provide responses to problems that arise from the subject of learning. Apart from that, students find it difficult to find problems that occur in the environment around them.

The way to overcome the obstacles faced by students in implementing the Gagnon and Collay learning model is a) The teacher intensively provides guidance and tries to focus on distributing attention to students evenly. b) The teacher slowly helps students to understand the material according to the learning model applied and explains clearly the learning model applied in the teaching and learning process. c) The teacher guides students to be able to find problems that often occur in the surrounding environment which are related to the subject matter.

3.2. Discussion

Based on the descriptive analysis carried out, this research revealed that students initially had Biology learning outcomes scores in the medium category, and this could be improved through learning by applying the Gagnon and Collay model. The average student score increased, namely 63.5 in cycle I and increased to 90.38 in cycle II. With these results, there was a significant increase in students' Biology learning outcomes, where in cycle I, only 34.37% of students were in the complete category and 65.63% of students were incomplete. Meanwhile, in cycle II, 100% of students were in the complete category and 0% of students were incomplete.

In the first phase, namely cycle I, teaching using the Gagnon and Collay model is characterized by the teacher providing opportunities for students to learn independently through various activities and reactions in new situations. Students are given space to discover new patterns, materials, and ideas with minimal guidance, which then encourages the emergence of new questions. In general, students' attention is still scattered on the visible

material, and some students ask for further explanation regarding the material that has been taught. Apart from that, it appears that students' responses to fellow students' answers tend to be limited to certain students. Overall, students' attitudes are still not completely positive towards the learning model used, perhaps because students themselves are not yet accustomed to learning patterns that involve structured cycles through several stages. Through observation and reflection, in the next cycle II, student activity and Biology learning outcomes increased.

This increase occurred because in the second cycle, a number of improvements were made, which involved (1) increasing the number of questions asked by teachers to arouse students' curiosity regarding problems relevant to everyday life, (2) imposing sanctions on students who were involved in activities. other things during the discussion of subject matter, (3) providing more intensive guidance to students or groups who are still experiencing difficulties in carrying out assignments or conducting research, (4) giving awards to students who provide positive responses, including those who ask questions or answer questions well .

After analyzing the observations and evaluating Biology learning outcomes in cycle I and cycle II, it was clearly seen that there was a significant increase in both the aspects of achieving learning outcomes and the level of student activity during the learning process. The improvement in the quality of student Biology learning outcomes can be seen from the increase in scores achieved by students on tests in cycle II, reflecting progress that can be measured concretely. Apart from that, student activity in class also experienced a marked increase, indicating more active participation in discussions, problem solving and other learning activities. This increase in Biology learning outcomes can be interpreted as the result of improved learning strategies implemented in cycle II. Increased interaction between teachers and students, emphasis on concepts relevant to everyday life, and the application of more intensive teaching methods can be identified as factors contributing to this increase [31], [32]. These results illustrate the commitment to continuously improve the quality of learning and optimize student learning potential.

This research reveals that the application of the Gagnon and Collay Learning Model significantly improves student learning outcomes in Biology subjects. These findings indicate that the method is effective in improving students' understanding and skills, creating a more interactive and creative learning environment, and increasing student motivation and participation. The implications of this research include improving the quality of learning, developing innovative teaching methods, establishing a supportive learning environment, increasing teacher professionalism, and providing a basis for policy makers to consider implementing this model in the curriculum. In addition, the results of this study open opportunities for further research in the application of the Gagnon and Collay Model to other subjects or at different educational levels, which can provide a more comprehensive understanding of the effectiveness of this model in various learning contexts.

This study has several limitations that need to be noted. First, the scope of the research is limited to one class. Second, this study uses a classroom action research design with only two cycles, which may not be enough to fully evaluate the long-term impact of implementing the Gagnon and Collay Model. In addition, external factors such as learning environment conditions as well as individual student variables such as motivation and academic background were not analyzed in depth, which could influence the research results. Therefore, similar research taking into account the limitations of this research is very necessary to obtain wider generalizations.

4. CONCLUSION

Based on research that has been conducted regarding the application of the Gagnon and Collay Learning Model to class XI Science 1 students at Public Senior High School 1 Bone-Bone, North Luwu Regency, it can be concluded that there has been an increase in understanding in the field of Biology. This increase occurred after the teacher carried out a series of efforts divided into two action cycles. Data from observations shows that the implementation of the Gagnon and Collay Model is able to change student learning patterns from previously inactive to active, increase the level of independence, and improve student learning skills. Results of students' understanding of Biology in class XI Science 1 at Public Senior High School 1 Bone-Bone, North Luwu Regency showed significant improvement after implementing this model. In the first cycle, the average score for understanding was 63.5 which was in the medium category, while in the second cycle, the average score increased to 90.38 which was in the very high category. Increasing students' understanding in the field of Biology occurs because students have been able to adapt to the Gagnon and Collay Model. This indicates that the learning model has succeeded in influencing the way students understand the lesson material. Therefore, researchers recommend implementing the Gagnon and Collay learning model and other innovative and interesting learning models to increase student understanding.

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